

XPS Tech Talk

Extruded Polystyrene Foam (XPS) Roof Applications: Direct to Steel Deck

A Better Choice with Real-World Benefits

There is a new choice in commercial, low-slope roofing insulation systems that can save energy and money for facilities professionals. Extruded polystyrene foam (XPS) insulation can be safely applied directly on a steel deck without a thermal barrier. Also referred to as “direct-to-deck” systems, this application means significant savings at the time of installation for building owners.

Equally good for facilities professionals are the unique benefits that XPS insulation offers, including a competitively-priced and superior long-term R-value (i.e., insulation value) which can play an important role in energy efficiency.

Superior Benefits at Competitive Prices

Extruded polystyrene foam (XPS) direct-to-deck systems provide superior benefits and enjoy acceptance from the nation’s model code bodies—including the International Building Code (IBC). XPS is a safe insulation option that features outstanding cost per R-value.

XPS insulation's R-value remains stable for a long-period of time—even under harsh, real-world conditions. The longevity of this sustainable R-value can translate into lower utility bills. For more information about the Long-Term Thermal R-Value (LTTR) of XPS, visit XPSA’s website at www.XPSA.com.

Durable

Extruded polystyrene foam is durable on the rooftop, as it withstands exposure to foot traffic, freezing and thawing cycles, and resists moisture absorption. In fact, XPS insulation is the most moisture-resistant plastic foam insulation available. Any insulation that is unable to endure these types of real-world application exposures can significantly lose its R-value, translating into higher energy costs and the premature need for re-roofing.

XPS insulation is dimensionally stable and serviceable in real-world applications. These benefits are particularly important to facilities management professionals since the main goal of roofing insulation is to prevent the passage of energy into and out of the building. If the insulating material is dimensionally unstable, the energy performance and membrane integrity of the entire roofing system can be severely compromised.

Proven Safety

Numerous large-scale tests, which most closely simulate real-world conditions and construction practices, demonstrate the safety of polystyrene direct-to-deck applications. These tests were conducted by Underwriters Laboratories and Omega Point Laboratories.

In addition, all three U.S. model code bodies have examined the safety and appropriateness of these systems and have all issued evaluation service reports for extruded polystyrene direct-to-deck systems. This examination led to the codification and acceptance of UL 1256 as an appropriate test for this application under the International Building Code (IBC).

Of course, the strongest safety evidence is real-world success. The outstanding track record of polystyrene direct-to-deck systems installed in commercial buildings nationally speaks volumes to its safe use. More than 70 million square feet of polystyrene direct-to-deck systems have been installed since 1986 and have performed without incident—just as predicted.

Building Code Compliance

The building codes, and specifically the International Building Code (IBC), have specific requirements that must be met in order for materials and systems to be used in building applications. Chapter 26 of the IBC contains requirements that must be met for foam plastic insulation used in commercial and residential building applications.

One very common use of extruded polystyrene foam (XPS) insulation is the commercial roofing market segment. In fact, it is the most common insulation used in this application. XPS is often specified for roofing applications because of its outstanding moisture resistance, strength, and resulting long-term insulating value.

In general, the IBC requires that foam plastic insulation be separated from the interior of the building by a thermal barrier unless specific performance requirements are met. In order for foam plastic insulation to be used directly on steel roof decks, without a thermal barrier, the product must pass third-party standard tests—either UL 1256 or FM 4450. Both of these tests are currently listed and codified in the IBC as appropriate tests for these systems. The products tested must be in a configuration representing the full roofing system intended for actual use.

XPS has been extensively tested to evaluate its fire performance when used directly on steel roof decks. XPS meets the most stringent test requirements of Underwriters Laboratories when used in conjunction with single-ply roofing membrane or standing seam metal roofing systems. To meet these requirements the product was tested via a large-scale test apparatus commonly referred to as the White House Test. This test involves a 20' wide x 100' long x 10' tall building. A fire source simulating a small fire which rapidly accelerates into a large fire is initiated in one end of the building. Fire spread in the roofing assembly is directly evaluated under these very severe conditions.

By meeting the above criteria, the use of XPS directly on steel roof decks meets the requirements of UL 1256, thus meeting the requirements of the IBC. UL listings for approved XPS direct-to-deck systems can be found on UL's website and are listed as: [UL Roof Deck Assembly: 440](#) and [UL Roof Deck Assembly: 457](#)

In addition to meeting the requirements of UL and the IBC, the use of XPS directly on steel roof decks has been tested per FM 4880 with a dry pipe sprinkler system installed. The system met the requirements of FM 4880 in this testing program. For more information go to the Specification Tested Products section of the FM Approval Guide, or call XPSA to be directed to a person who can send you the test information.

Are You Really Getting What You Paid For?

Quality roof insulation with a sustainable R-value, such as XPS, can translate into long-term energy efficiency and savings. XPSA encourages facilities construction and management personnel to question insulation manufacturers about R-value claims and real-world exposures that can adversely impact R-values. At a minimum, the following topics must be addressed and questions must be asked and answered to ensure you are really getting the value for which you originally thought (... and paid).

Rooftop Durability

- Is the insulation durable on the rooftop?
- Can it withstand real-world conditions such as moisture intrusion, freezing and thawing, and foot traffic?
- Is it dimensionally stable?
- Is it prone to facer delamination?

Understanding R-value Claims

- Are insulation value claims based on a “conditioned” or “initial” R-value—or the more meaningful “aged R-value”?
- Will the R-value remain stable over time?
- What environmental and real-world-use factors impact this value?